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08/970,066	11/13/1997	PRADEEP K. DHAL	C-8232	2141
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POLAROID CORPORATION PATENT DEPARTMENT 1265 MAIN STREET WALTHAM, MA 02451			ANGEBRANDT, MARTIN J	
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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 08/970,066
Filing Date: November 13, 1997
Appellant(s): DHAL ET AL.

Gaetano D. Maccarone (25,173)
For Appellant

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EXAMINER'S ANSWER

This is in response to the appeal brief filed September 10, 2004.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) *Related Appeals and Interferences*

A statement by the appellant that there are no related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

The examiner notes that there was an appeal, which may have a bearing on the pending appeal. This is the Board of Appeal decision of paper 19 of the instant application dated September 04, 2002. This is identified as Appeal No. 2000-1079 and the examiner was affirmed on the rejections of similar process claims on similar grounds.

(3) *Status of Claims*

The statement of the status of the claims contained in the brief is incorrect. A correct statement of the status of the claims is as follows:

Claims 28-40 have been rejected as unpatentably obvious over the references applied in support of the rejections.

Issue (a) (The rejection under 35 USC 112, first paragraph) is withdrawn based upon the discussion with respect to R⁸ as the only epoxide moiety and “polyfunctional” as requiring three or more epoxide moieties [0014 in prepub].

Issue (b) is withdrawn based upon the arguments concerning the allyl glycidyl ether using in example 18 of Watt being free radically polymerizable.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is substantially correct. A correct statement of the issues is as follows (the examiner has adopted the applicant's lettering to delineate the issues):

(c) Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Meier et al. '233.

(d) Claims 28-31 and 39-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dhal et al. WO/97/1318, in view of Ohe et al. '345, Keys et al. '567 and *Cornforth et al. '016*.

(e) Claims 28-31 and 39-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dhal et al. WO/97/1318, in view of Ohe et al. '345, Keys et al. '567, *Cornforth et al. '016* and Sato et al. '846.

(f) Claims 28-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dhal et al. WO/97/1318, in view of Ohe et al. '345, Keys et al. '567, *Cornforth et al. '016* and Crivallo et al. J. Polymer Sci. and/or Eckberg et al. EP 0391162.

(7) *Grouping of Claims*

The rejection of claims 28-40 stand or fall together because the appellant's brief includes a statement to that effect.

(8) *Claims Appealed*

A substantially correct copy of appealed claims 28-40 appears on pages 30-33 of the Appendix to the appellant's brief. The minor errors are as follows: In claim 28, a typographical error "epoxide" appears in line 3 and was added in the after final amendment of April 6, 2004, the correct spelling - epoxide - is present in the amendment of August 07, 2003.

(9) *Prior Art of Record*

5,124,233	Meier et al.	06/1992
WO97/13183	Dhal et al.	04/1997
5,698,345	Ohe et al.	12/1997
5,418,016	Cornforth et al.	05/1995
4,950,567	Keys et al.	08/1990
5,702,846	Sato et al.	12/1997
EP 391162	Eckberg et al.	10/1990
3,658,526	Haugh	04/1972

Crivello et al., "The synthesis, characterization, and photoinitiated cationic polymerization of silicon-containing epoxy resins.", J. polymer Sci., Part A: Polymer Chem., Vol 28, (1990), pp. 479-503.

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

(c) Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Meier et al. '233.

Meier et al. '233 teaches in example 3 (col. 10) a composition including a epoxide of bisphenol A and Epoxy cresol novolak (polyfunctional epoxide 4/20-21) mixed with stilbene cyclopentadienyl iron tosylate to render it light sensitive. The addition of a binder is disclosed as rendering the composition aqueous developable. (5/64-6/2)

It would have been obvious to one skilled in the art to add a binder to the composition of example 3 to render the composition aqueous developable

(d) Claims 28-31 and 39-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dhal et al. WO/97/1318, in view of Ohe et al. '345, Keys et al. '567 and Cornforth et al. '016.

Dhal et al. WO/97/1318 teaches the use of compositions including at least one difunctional silicon containing monomer capable of undergoing cationic photopolymerization in examples 1-3. The use of any monomer capable of undergoing cationic polymerization is disclosed on pages 6 and 7. Useful photosensitizers and photoinitiators are disclosed on pages 5 and 7. Useful binders are disclosed on page 4. Dhal et al. in example 1 teaches the use of blanket exposures with cationically curable holographic recording media, while in example 2, no blanket exposure is used.

Ohe et al. '345 teach the use of cationically polymerizable materials, which result in improved diffraction efficiency and superior environmental properties. Useful epoxides include those disclosed in columns 12-15 including mono, di and polyfunctional monomers.

Keys et al. '567 teach that when more crosslinking is desired, the use of multi functional monomers in amounts up to 5% is a means to achieve this.

Cornforth et al. '016 teaches the use of mono, di and polyfunctional monomers in radiation curable compositions. The high functionality monomers are disclosed as giving rapid cure speeds, and high crosslinking density, which results in films having good chemical resistance and hardness, but poor adhesion. (1/65-2/12).

It would have been obvious to one skilled in the art to add other, multi functional epoxy monomers/oligomers, such as those disclosed by Ohe et al. '345, to the composition of examples 1-3 of Dhal et al. WO/97/1318 and use them in forming a hologram based upon the direction to use more than one and that any cationically polymerizable compound(s) would be useful in the composition within the Dhal et al. WO/97/1318 reference, their previous use within the holographic art by Ohe et al. '345 and the direction to the addition of polyfunctional monomers when increased crosslinking is desired in the holographic art by Keys et al. '567 and Cornforth et al. '016 and increases the curing speed as disclosed by Cornforth et al. '016.

(e) Claims 28-31 and 39-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dhal et al. WO/97/1318, in view of Ohe et al. '345, Keys et al. '567, Cornforth et al. '016 and Sato et al. '846.

Sato et al. '846 teaches useful cationic polymerizable compounds (3/5-4/4). The use of compounds having a siloxane group increases, refractive index modulation. This includes compounds embraced by formula (I). The use of multiple epoxides is disclosed (3/45-48). Example 2 uses a cationically polymerizable siloxane compound, a free radically polymerizable compound, photoinitiators for each and a polymeric binder. (table 2, columns 9-10). The structure of the silicon containing cationically polymerable materials is disclosed in column 21 and is identical to the formula in claims 3. The recording of the interference fringe by cationic polymerization is disclosed. (5/36-41). The use of various binders including polyvinyl pyrrolidone is disclosed. (7/15-22).

In addition to the basis provided above, the examiner holds that it would have been obvious to use other siloxane compounds known to be useful cationically polymerizable materials, such as those disclosed by Sato et al. '846, in place of those specifically used in examples 1-3 of Dhal et al. WO/97/1318 as modified by Ohe et al. '345, Keys et al. '567 and Cornforth et al. '016 with a reasonable expectation of achieving comparable results based upon the direction within Dhal et al. that any cationically polymerizable compound(s) would be useful in the compositions disclosed in Dhal et al. WO/97/1318.

(f) Claims 28-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dhal et al. WO/97/1318, in view of Ohe et al. '345, Keys et al. '567, Cornforth et al. '016 and Crivallo et al. J. Polymer Sci. and/or Eckberg et al. EP 0391162.

Crivallo et al. J. Polymer Sci., Vol. 28A pp. 479-503 teaches the use of various epoxy silane compounds including those shown in tables I and II. Useful properties appear in pp 501-503

Eckberg et al. EP 0391162 teaches the use of cationically curable compounds embraced by the formula shown in the abstract and on page 5 with cationic photoinitiators.

In addition to the basis provided above, the examiner holds that it would have been obvious to use other siloxane compounds known to be useful cationically polymerizable materials, such as those disclosed by Crivallo et al. J. Polymer Sci. and/or Eckberg et al. EP 0391162, in place of those specifically used in examples 1-3 of Dhal et al. WO/97/1318 as modified by Ohe et al. '345, Keys et al. '567 and Cornforth et al. '016 with a reasonable expectation of achieving comparable results based upon the direction within Dhal et al. that any cationically polymerizable compound(s) would be useful in the compositions disclosed in Dhal et al. WO/97/1318.

(11) Response to Argument

(c) The applicant argues that there is no teachings concerning the use of these compositions for holographic recording. The applicant also implies that the binders disclosed by Meier et al. do not meet the limitations

The examiner holds that the compositions are photosensitive and undergo selective curing via cationic polymerization to form soluble and insoluble areas in the resist film. The presence of the binder would not prevent the composition from acting as in the manner disclosed

(ie as a photosensitive resist) and therefore does not inhibit cationic polymerization. The examiner holds that as the chemical composition of the binder and the polymerized monomers are different, they would be expected to have different physical properties, including refractive indices. Further, the examiner notes that resist materials are known in the art to be useful in forming volume holograms as disclosed in Haugh et al. 3,658,538, published in 1972 (cited 10/09/2003). To one of ordinary skill in the art, the ability of the composition to function as a photoresist does not inherently preclude it from being able to record a hologram.

(d) The applicant argues that the combination of the references does not show the benefit discovered by the applicants, in that minimal shrinkage occurs when difunctional and polyfunctional monomers are used. The applicant agrees that using tri or higher functional monomers will rigidify the resulting polymeric structure and that this is well known in polymer technology. The applicant argues that this teaching has nothing to do with the benefits achieved by or problems solved by the applicants. The examiner disagrees, noting that increased crosslinking, and the resultant increase in rigidity due to it, would be expected to reduce shrinkage as *the more rigid structure would be more resistant to forces acting upon it*. This would be appreciated for polyfunctional monomers irrespective of the mechanism by which the crosslinking occurs. The increased rigidity and reduced shrinkage due to that rigidity would be expected with increased crosslinking for both cationic and free radical polymerization systems and this position is supported by Cornforth et al. '016. Direction to use increased crosslinking within the photocuring art is shown by Keys et al. '567 and as similar enhancement photopolymerization processes are used to achieve similar results (crosslinked polymers, rather

than merely a collection of straight polymer chains), would be expected to achieve similar benefits. Additionally, increased refractive index modulation and resistance to abrasion and/or swelling (causing drift of replay wavelength) could reasonably be expected by one skilled in the art.

The applicant is incorrect in asserting that the Ohe et al. reference only forms a latent image. After the holographic exposure, the hologram is immediately readable due to the variation in the refractive indices caused by the selective curing in correspondence to the interference fringes, although the flood exposure does make it more stable. In photographic film, the silver halide requires development because the effect of the (minimum of four) photons cannot change the silver halide crystal to silver metal without amplification. In photopolymerizable systems (see Haugh '526 column 9/lines 33-71), the interferometric image is immediately readable after formation and does not require any amplification. See also example XXXVI in Haugh '526, where the hologram is viewed during formation. The curing exposure does not make the hologram. *The examiner also points out that the claims are not directed to the method and therefore cannot exclude a post exposure processing step, such as a blanket exposure. Dhal et al. in example 1 teaches the use of blanket exposures with cationically curable holographic recording media , while in example 2, no blanket exposure is used.*

The decision of appeal 2000-1079 found, on the basis of the teachings of Dhal alone, “that one of ordinary skill in the art would have found it obvious to employ both difunctional and polyfunctional epoxide monomers, either singularly or in combination, in processes for preparing holograms like that disclosed by Dhal and presently claimed.” (pages 4 and 5 of the decision). The Board of Appeals also felt that the addition of Ohe et al. buttressed this position as did the

teachings of Keys et al., due to the teachings of increased crosslinking. (page 5 of the decision). The decision also noted that the applicant had provided no objective evidence to rebut the rejections of record. (page 6 of the decision). In response the applicant filed an affidavit under 37 CFR 1.132 executed by David Waldman.

As set forth in the final rejection, the examiner has examined the data of the declaration, particularly that of figures 1, 2 and 4. The examiner determined that to achieve a diffraction intensity of 400 microwatts, type I required an exposure of 42.78 (sec mW/cm^2), type II required an exposure of 23.97 (sec mW/cm^2) and type III required an exposure of 20.46 (sec mW/cm^2) which supports the trend in the balance of the affidavit without the possible error due to the differences in the dynamic range of the media or the exact location of the shoulder (see James, "The Theory of the Photographic Process", pp. 501-510 (1977) particularly analogous to figure 17.36.). The applicant is correct in asserting that the addition of higher functionality monomers results in increased sensitivity/speed in the composition. This is appreciated in the radiation curing arts as evidenced by Cornforth et al. '016 and therefore cannot be considered unobvious to one of ordinary skill in the art. The examiners position is that the increased speed/sensitivity is an obvious result of adding polyfunctional monomers based upon the teachings of Cornforth et al. '016. Further, the increased crosslinking available due to the use of polyfunctional monomers allows the linear polymeric chains bond to one another and form two and three dimensional structures, rather than collection single polymeric chains and would be expected by one of ordinary skill in the art (polymerization arts) to exhibit increased structure (rigidity) due to this bonding between polymer chains and resist shrinkage due to the additional dimensionality of the polymerized structure.

(e) As discussed above, the medium may not require post processing, but Dhal et al. certainly does not exclude the use of blanket exposures to amplify the diffraction. While, Sato et al. does exemplify the use of the free radically polymerizable species to form the hologram, the recording of the interference fringe by cationic polymerization is disclosed in that reference. (5/36-41). Also it is clearly established for the record in Dhal et al. that cationically curable materials may be used to form holograms in the absence of any free radically polymerizable compounds. The applicant argues that it would not have been obvious to one skilled in the art to only take a portion of the teachings of Ohe et al., Keys et al. and Sato et al. (ie only the teachings with respect to cationically curable materials or polyfunctional monomers). This position conflicts with the previous appeal decision and neglects the teachings in Dhal et al with respect to using only cationically curable materials and specifically pointing out of the problems with free radically polymerizable materials on pages 1-3, including shrinkage, inhibition of the free radically polymerization reaction by oxygen, high intensity reciprocity failure, difficulty recording low frequency holograms and required post exposure.

(f) The applicant argues, that although Dhal et al. does broadly teach the use of any cationically polymerizable materials, the specific combination of the difunctional and polyfunctional epoxides together with the reduced shrinkage and higher sensitivity (lower threshold energy) is not taught or rendered obvious by the references applied. These issues have already been addressed above with respect to the findings of the Board of Appeals and the teachings of the secondary references Keys et al and Cornforth which teach polyfunctional

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monomers as resulting in rapid cure speeds and high crosslinking density, which results in films having good chemical resistance and hardness. The rejection stands.

For the above reasons, it is believed that the rejections should be sustained.

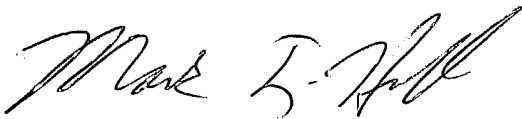
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